

# A LAKE SUPERIOR COPPER MINE

(Calumet & Hecla)

## SYNOPSIS OF FILM

1. General View of Surface Plant.
2. Shoring Timbers Used to Support Roof and Sides of Tunnel.
3. Miners Entering "Man Car" ready to Descend.
4. Giving the Signal to Lower the Car.
5. "Man Car" Starting on its Trip to the Lowest Level more than a Mile below Surface.
6. The Empty Skip (ore car) Entering Slope.
7. Setting up a Drill a Mile Underground.
8. Timbering—Putting up Huge Timbers to Support Roof and Sides of Tunnel.
9. Loading the Skip (ore car) with Copper Ore.
10. Hoisting the Skip.
11. The Loaded Skip.
12. Entering the "Breaker" or "Stamp" Mill.
13. Dumping Ore on Perforated Apron.
14. Ore Passing into the "Breaker" or "Stamp."

15. Crushed Ore Dumped into Cars Below.
16. Long Train of Ore Cars on Way to Smelter.
17. At Smelter—Ore being Crushed by Stones in Machines.
18. Copper being shaken from Sand onto Vibrating Table.
19. Washing Away the Sand.
20. Melting and Pouring Copper by Hand into Molds.  
(Old Method.)
21. Pouring Copper into Revolving Molds to Form Anode Plates to be Refined in the Electrolytic Process.
22. Cooling the Plates for Rapid Handling.
23. View of Electrolytic Room where Chemically Pure Copper is obtained from the "Blister" Copper.
24. Anode Plates being carried to Electrolytic Room.
25. Plate being deposited in Tanks to be dissolved by action of Acid and Electricity.
26. Removing old Plates to be Remelted.
27. 6,000 Bars of Copper. \$100,000 worth.

## COPPER MINING

THE copper mines of the Lake Superior district are the oldest and the best known in the United States. Long before the Pilgrim Fathers landed at Plymouth, the Indians of that vicinity had discovered the veins of copper which outcropped at the earth's surface, and had worked them to a very limited extent.

The copper formed in these regions is native copper; that is, it appears in its true metallic form, in flakes and small nuggets scattered through the rock which contains it. In the Montana and Arizona mines, on the other hand, copper appears in the form of ore usually combined with sulphur, and shows no metallic copper until the ore is smelted.

The most famous of all American copper mines is the Calumet and Hecla mine of Calumet, Michigan, and the views hereafter exhibited are those of the Red Jacket shaft of that mine.

The first scene gives a general survey of the surface plant, including the crusher and the shaft house.

A view from the top of the tower follows with a close view of the "Crusher" house. We are at once conducted to the entrance of the shaft house, where the men of one of the three eight-hour shifts are seen entering the man car. At a given signal, as shown in the following scene, the car is lowered by a steel cable to the level where the men are to work.

The "skip" or ore car, with a capacity of seven tons, is drawn to that shaft house, lowered by cable 4,950 feet to the lowest level, loaded with ore, and hauled to the surface.

The skip now ascends an incline to the crusher where it dumps its load upon an inclined "apron" with a grating

through which the ore passes to the waiting trains below. Such lumps as are too large to pass through the grating are forced into the crusher which breaks them up into pieces about five inches in diameter. One crusher-house handles about 1,500 tons of rock a day.

In the machine shop the drills are conveyed from the top of the shaft on an endless belt and automatically sharpened. An electric crane then carries them to the tool room.

The ore trains carry the broken rock from the crusher to the stamp mills, five miles away, where it is pounded into sand. Ordinary large pebbles, such as are found along the shores of most lakes, are put in with the ore to be crushed. These are harder than the trap rock containing the ore and help to pulverize the ore-bearing rock. Water is now mixed with pulverized ore and rocks and the heavy copper settles to the bottom. The copper is roughly separated from the sand, afterward melted. The ore-bearing sand must be milled once more after it is crushed in the stamp room. It is first carried to vibrating tables on the floor above by means of an immense wheel, which has the appearance of an amusement park Ferris Wheel. The waste from these tables is carried through pipes to the dump. The sluiceway trestle leading from the stamp room to the dump is here shown.

We now see the vibrating table, called the Wilsley table, in operation. The ground ore, sand, and water flow over this table and the copper is deposited in the grooves while the sand and water are carried over the edges. The lines of sand, copper and mud may be plainly seen.

The sand is returned to the mill for further crushing and again joggled for more copper.

Finally the sand is treated chemically to remove any remaining copper. The copper is then carried to the smelter



where it is melted in huge furnaces and poured by hand, as blister copper, into molds of any desired shape, or directly from the smelter into anode molds. These anodes are plates of impure copper. They are later dissolved in tanks, and the pure copper in solution is then attracted to pure copper plates called cathodes. The anodes are conveyed automatically from the spout and passed through water to be cooled.

Anode plates are used in what is called the electrolytic process of refining copper. A view is given of a series of these plates of blister copper as they are removed from their rack and carried by an electric crane to their proper tank and released. These tanks contain a solution of blue vitriol, or blue stone, and sulphuric acid, together with a little salt or hydrochloric acid. An electric current is sent through the contents. The impure anodes are dissolved and the pure copper in solution is attracted to other plates, or to the back of the anodes, and forms a sheet of pure electrolytic copper. The other substances in the anodes, such as gold or silver, are precipitated to the bottom as "slime," and this slime is treated by a special process. The value of silver alone recovered from the Calumet and Hecla's tanks averages \$30,000 a month. This is simply a by-product.

The anodes, now very thin, are automatically removed and sent to the smelter to form new anode plates. The fine copper is stripped from the cathodes and smelted to form ingots, a huge pile of which can be seen in our picture ready for shipment.

A few facts concerning the Calumet and Hecla Mine. There are about 30 pounds of copper in best ore to a ton of rock. One ton of rock yields a ball of copper about five inches in diameter, worth now about \$5 or \$6.

## QUESTIONS, TOPICS, SUGGESTIONS

1. State some commercial uses for metallic copper.
2. What electrical inventions depend upon copper for their success?
3. Name household utensils made of copper.
4. What is brass? Bronze? Why is copper alloyed?
5. What effect would the loss of copper have upon civilization?

## REFERENCES

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KEITH, N. S. Electrolytic process of recovering copper. Electrical review, N. Y., vol. 40, No. 12. March 22, 1902.

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